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n-Butyl cyanoacrylate adhesive for skin closure of abdominal wounds: preliminary results

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Tissue adhesives offer significant potential advantages over traditional methods of wound closure. A new *n*-butyl 2-cyanoacrylate adhesive formulation was utilised for the closure of abdominal wounds after general and laparoscopic gastrointestinal surgery. One hundred and two patients with 240 wounds were recruited. Wounds were classified as >10 cm, *n*=39; 5–9 cm, *n*=27; and <5 cm, *n*=176. Complications included one small seroma and two partial superficial dehiscences. There were no incidences of wound infection.

This preliminary study indicates that this tissue adhesive can safely and effectively be utilised for general abdominal wound closure. It should now be subjected to the rigours of a randomised controlled trial to compare its performance against the more traditional methods of wound closure.

The potential ability of an adhesive to effect a rapid and complete tissue closure with a minimum of tissue deformation and without risk of needle-stick injury has obvious advantages over traditional methods of skin closure. While accepted practice for small facial lacerations *(1)*, no study has analysed the application of tissue adhesive for larger abdominal incisions and laparoscopic port site wounds. We therefore investigated the feasibility of using a new sterile, transparent *n*-butyl 2-cyanoacrylate adhesive formulation (Indermil, Loctite, Ireland) for abdominal wound skin closure.

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Methods

Patients undergoing general and laparoscopic gastrointestinal operations were recruited into the trial. At the time of closure the deep fascial layers were dealt with in the conventional manner according to the procedure performed. The skin to which the tissue adhesive was to be applied was then cleaned and dried. The skin edges were approximated and maintained in apposition with forceps or skin hooks and the adhesive applied sparingly along the edge of the wound. Light pressure was maintained for 10 s. A second layer was then applied to the opposed wound edges.

Wounds were classified according to site and length: >10 cm, 5–9 cm, <5 cm. Postoperatively, the wounds were inspected for evidence of haematoma formation, wound infection and dehiscence.

Results

A cohort of 102 patients with 242 abdominal wounds were recruited: >10 cm, *n*=39; 5–9 cm, *n*=27; and <5 cm, *n*=176. Wounds after inguinal hernia repair made up the 5–10 cm group. The <5 cm abdominal wounds consisted

Table I. Wound size and site

Wound size and site	*Number*
Wounds > 10 cm	
Midline	18
Transverse	19
Subcostal	2
Total	39
Wounds 5–9 cm	
Groin hernia	27
Wounds < 5 cm	
5 mm	48
10 mm	89
> 10 mm	39
Total	176
Overall total	242

of laparoscopic port sites for laparoscopic cholecystectomy, laparoscopic inguinal hernia repair, laparoscopic colonic resection and laparoscopic rectopexy (Table I).

There were two instances of small superficial skin dehiscence in transverse abdominal wounds (> 10 cm) after colonic resection for malignancy and one small serous collection. The tissue adhesive was used to re-approximate the skin edges after one of the superficial dehiscences and the wound healed without further incident. There were no wound infections and the overall complication rate was 1.2%. All the surgeons involved reported that the adhesive was simple and easy to use.

Discussion

Cyanoacrylate tissue adhesives have been utilised for a number of medical applications including traumatic laceration repair *(1,2)*, bronchopleural fistula repair *(3)*, pulmonary resections *(4)*, repair of myocardial tears *(5)*, and mesh fixation for inguinal hernia repair *(6)*. Tissue adhesives have been shown to have similar cosmetic results to suturing and to be a significantly faster method of skin edge apposition in small facial lacerations *(1)*. In addition, the risk of needle-stick injury is obviated and there is no need for the patient to return for the removal of sutures or clips.

Cyanoacrylate adhesives are available in short (methyl- and ethyl-cyanoacrylates) and longer chain (butyl- and isobutyl-cyanoacrylate) derivatives. The longer chain derivatives, such as *n*-butyl 2-cyanoacrylate are the least histotoxic *(7)* and *n*-butyl-2-cyanoacrylate is currently the only cyanoacrylate tissue adhesive in clinical use. After the application of the adhesive the cyanoacrylate penetrates into the interstices of the tissue and becomes immobilised by polymerisation. Adhesion is achieved by attraction between the molecules of cyanoacrylate. The bond strength depends on the morphology of the tissue site and the preparation of the surfaces to be bonded. Previous tissue adhesives have caused problems with tattooing owing to the colour of their formulation. It has also not been possible to sterilise these adhesives to the accepted standard. The tissue adhesive evaluated in this study is colourless, sterile and completely removed from the tissues by enzymatic action in approximately 30 days. These properties make it ideally suited to the closure of larger abdominal wounds.

The two instances of partial superficial dehiscence of transverse abdominal wounds seen in this series followed colonic resection for malignant disease. Both these dehiscences occurred early in the series and were probably related to the inadequate drying of the skin edges before the application of the adhesive. There was certainly no evidence of concomitant wound infection in these cases. Indeed, despite the number of large bowel resections included in this series there were no clinically significant wound infections. The bacteriostatic nature of the adhesive and the completely occlusive nature of the closure achieved may have contributed to this low infection rate.

The results of this preliminary study indicate that this *n*-butyl-2-cyanoacrylate adhesive formulation (Indermil, Loctite, Ireland) can be used as a reliable and safe method of general abdominal wound closure. It should now be subjected to the rigours of a randomised controlled trial in order to compare its performance against the more traditional methods of wound closure.

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